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SUSTAINABLE AGRICULTURE  
RESEARCH AND EDUCATION

and

AGRICULTURE IN CONCERT  
WITH THE ENVIRONMENT



**WESTERN REGION  
ANNUAL REPORT  
1994**



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## SUSTAINABLE AGRICULTURE RESEARCH AND EDUCATION

and

## AGRICULTURE IN CONCERT WITH THE ENVIRONMENT

# WESTERN REGION ANNUAL REPORT, 1994

by

Kristen Kelleher, Regional Communications Specialist

J. Patrick Madden, Associate Director SARE and ACE Programs

Alice J. Jones, Interim Director SARE and ACE Programs

David E. Schlegel, Regional Coordinator

Harry W. Wells, EPA Sustainable Agriculture Liaison

The Western Region includes: Alaska, Arizona, California, Colorado, Hawaii, Idaho, Montana, Nevada, New Mexico, Oregon, Utah, Washington, Wyoming and the Island Protectorates.

Regional Program Staff: David E. Schlegel, coordinator, 1988-94; V. Philip Rasmussen, incoming coordinator; Denise Bodie, program manager; Kristen Kelleher, communications specialist/public information; Peggy Michel, secretary.

1994 Administrative Council: Robert Heil, Chair, Colorado State University Experiment Station Director; Jim Dyer, AC Chair Elect, Rocky Mountain Institute, Colorado; Eric Davis, rancher, Idaho; Janet Hren, US Geological Survey, California; Clarence Maesner, Soil Conservation Service, Oregon; Ralph Nave, Agricultural Research Service, California; Jerry Schickedanz, Cooperative Extension Service, New Mexico; Larry Thompson, grower, Oregon; Wilbur Wuertz, farmer, Arizona. Ex Officio National Program Representatives: Alice Jones, interim SARE program director; Jerry Dewitt, Iowa State University, Extension Service representative; Harry W. Wells, EPA Pollution Prevention Office; Patrick Madden, associate director of the SARE and ACE programs; Denise Bodie, program manager, SARE and ACE programs.

1994 Technical Review Panel: An ad hoc committee of farmers, ranchers, scientists, and representatives of various organizations is selected each year, with membership tailored to the content of the proposals to be reviewed.

Policy Advisory Committee: An interdisciplinary group of research and Extension scientists from the Western states entitled "Evaluating the Transition to Sustainable Agriculture" meets annually as a Western Region Coordinating Committee (WRCC 67) to advise the Administrative Council about future directions of the SARE/ACE program.

## Foreword

Thank you for your interest in sustainable agriculture and the progress of the Western Region SARE/ACE program. It has been a favorable year for the program, full of worthwhile events and promising work. This Report to Congress documents the scientific accomplishments, educational outreach and ground-breaking areas of investigation undertaken in 1993. The report illustrates the viability and long-term potential of this program — demonstrating an effort that is both good government and good science.

Early in 1993 we were pleased to see an increase in funding allocated to USDA for sustainable agriculture research and education. And, for the first time, an additional "chapter" of SARE (as written in the 1990 Farm Bill) was funded in the 1993-94 fiscal year. The near \$3 million allocated to Chapter 3 will be divided equally among the four SARE regions to train extension educators in sustainable agriculture. Further funding increases are now proposed for the upcoming 1994-95 fiscal year as well. Clearly, the federal Executive and Legislative branches of government are showing their growing interest in sustainable farming practices as a means of maintaining the nation's food supply while also protecting natural resources and ensuring quality of life for farm families and rural America.

This was also a landmark year for the program for other reasons. After leading the SARE effort in the West since its beginnings in 1988, I will be turning over administration of the regional program to V. Philip Rasmussen of Utah State University in 1994. After a University of California decision to transfer the program out of its headquarters office, a region-wide, open selection process was conducted by the Western SARE Administrative Council. Phil Rasmussen was chosen as the new coordinator, representing Utah State University as the host institution for the program.

As I reflect on my involvement in sustainable agriculture and the SARE program for the past eight years, I am grateful to have had the opportunity to help shape this national scientific effort and see it take on significant momentum at local, regional and national levels. It has also been a pleasure to work with such committed professionals in a variety of governmental and educational settings.

Best Regards,

David E. Schlegel  
University of California  
Regional Coordinator, Western SARE/ACE

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## Executive Summary

Following is a summary of noteworthy portions of the report.

### Project Highlights

#### *Farmers and Scientists Partner on Long-term Research*

**California** farmers and scientists are comparing conventional, low-input and organic farming methods for a variety of important crops. Crop yields of **processing tomatoes**, safflower, beans and small grains were virtually the same in 1993 across all methods. Researchers say their results show that equal yields are attainable in all types of production. Using tomato transplants is a promising way to increase yields in organic and low-input farming. (Project number LW89-18)

#### *Multiple Water Uses Expanding Farm Diversity*

In **Arizona**, integrating fish farming with crop production is benefiting the environment and pocketbooks of farmers. In greenhouse studies, landscape turf grass grown with fish discharge water grew better than turf irrigated with well water. Growth rates of mesquite trees significantly increased when irrigated with water first used for fish production. When water was shared by a fish farmer and a cotton farmer, the cotton grower saved about \$50 per acre in irrigation costs and the need for added fertilizers was cut from 50 percent to as much as 78 percent. (Project Number AW91-2)

#### *Sustainable Potato Production*

**Idaho** scientists are testing non-chemical methods to suppress crop pests and disease, improve soil fertility and reduce erosion. Rapeseed green manure (canola) cover crops have provided up to 80 percent control of the plant parasite root-knot nematode, and provided weed control without herbicides. In farm studies, this method resulted in **potato** yield increases from 10 to 50 percent. Also, growing nitro alfalfa or Austria peas cover crops before potatoes provided half to 100 percent of the crops' nutritional needs without synthetic fertilizers. (Project Number LW91-29)

#### *"Trap Crops" Battle Pests and Bolster Yields*

Using natural enemies to battle pests is being studied by **Wyoming** scientists who hope to control the cyst nematode, a major blight to the state's most profitable crop, the **sugarbeet**. By integrating "trap crops" into rotations, researchers have seen up to 69 percent control of the pest and increased yields of more than five tons per acre -- a 30 percent yield increase compared with aldicarb-treated plots. Aldicarb is the prevalent chemical treatment for mitigating nematodes. The estimated cost of growing trap crops was more than offset by major increases in yields. (Project Number LW91-22)

#### *Sustainable "Tools" Compare or Beat Toxic Inputs*

Scientists and cooperating peach growers in the Central Valley of California are

comparing conventional and sustainable farm practices. Results show that insect control in all sustainable test plots was as good or better than conventionally-managed areas. As many as three sprayings of a total of 6 lbs. per acre of organo-phosphate insecticides were eliminated in test plots. (Project Number LW91-28)

#### *Biological Warfare on a Major Weed Pest*

The destructive weed jointed goatgrass now infests about five million acres nationally and is reducing growers' income by \$145 million annually. Scientists at Washington State University are pioneering an approach to biological control of this weed by isolating and using soil bacteria to inhibit its growth. Two of four recently-tested bacteria effectively reduced the goatgrass. This approach could reduce farm costs and minimize dependence on pesticides. (Project Number AW91-5)

#### **Regional Program Activities**

The 1993 Call for Proposals drew 35 submissions. It again emphasized whole farm systems for the SARE program and reducing environmental stress from agricultural practices for ACE. Twenty-three SARE and ACE projects were funded for the first time or renewed.

#### *Profile of Current Projects*

There are currently 42 active Western SARE and ACE projects. Based on profile data submitted by the coordinators of 32 projects:

Fifteen SARE and seven ACE projects focus on whole farm systems. The most prevalent

aspects of both SARE and ACE efforts are "education, training and information transfer" components (29 projects). Seventeen SARE and ACE projects include economic analysis; 17 include environmental impact assessment; 16 consider quality of life issues; and 30 are experimental in nature.

The SARE/ACE program strives to involve farmers and ranchers in all aspects of projects -- 377 farmers generated ideas for SARE projects and 44 generated ideas for ACE efforts. In total, 258 farmers helped design projects; 230 helped manage projects; 443 evaluated projects; 135 made presentations in workshops; and 113 provided land for experiments; among other tasks.

#### *Selection of New Host Institution for Western SARE/ACE*

Search for a new coordinator and host institution was a foremost priority for the regional program. A request to transfer the program from the University of California was announced in August, as part of a UC reorganizational effort. The Administrative Council led an open selection process in which all organizations and educational institutions in the Western U.S. could apply for consideration. After thorough review, the Administrative Council named V. Philip Rasmussen the new coordinator, and Utah State University the host institution. USDA-CSRS has approved the selection.

#### *Success of "Science and Sustainability" Conference*

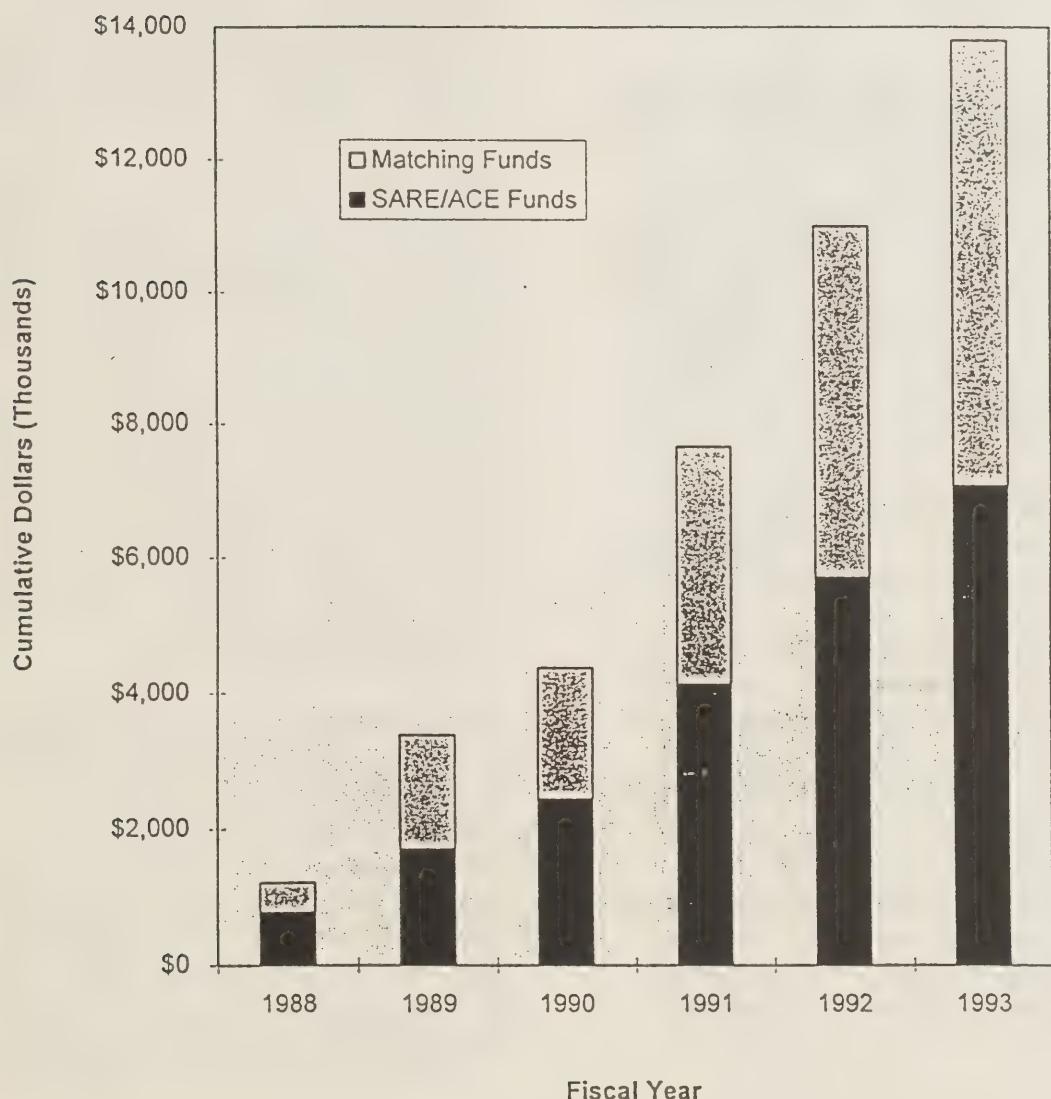
Over 200 scientists, administrators and educators from across the nation attended

this SARE-sponsored conference. The forum, held in Bellevue, Washington, examined the state of sustainable agriculture on national research and educational agendas. Keynote speaker was USDA Deputy Secretary Richard Rominger. The major papers presented will be published in a special issue of the American Journal of Alternative Agriculture.

## *Matching Funds Nearly Double Program Resources*

In the Western Region matching funds total \$6.7 million, or 92 percent of SARE and ACE funds Figure 1.

**Figure 1**  
**Cumulative Matching and**  
**SARE/ACE Federal Funding**  
**(Western Region)**



## **Overview of the National SARE and ACE Programs**

### ***What is the Sustainable Agriculture Research and Education Program?***

SARE was initiated in 1988 and is currently authorized under Chapter 1, Subtitle B of Title XVI of the Food, Agriculture, Conservation and Trade Act of 1990 (FACTA).

***What is the SARE appropriation?*** The appropriation was \$6.7 million in FY 1993, and \$7.4 million in FY 1994.

***How much matching funding has been provided?*** Between 1988 and 1993 a total of \$30.7 million of non-federal matching funds have been provided by project participants. This is 110 percent of the total SARE and ACE funds allocated to these projects.

***How is SARE managed?*** SARE is administered by the USDA Cooperative State Research Service in close cooperation with Extension Service. It is managed through four regional host institutions or host consortia: University of California (switching in 1994 to Utah State University), University of Vermont, University of Nebraska, and University of Georgia in conjunction with Fort Valley State College. Each region has an administrative council composed of farmers and ranchers, and representatives of non-profit private organizations, agribusiness, government and academic institutions.

### ***What is the responsibility of the National Sustainable Agriculture Advisory Council?***

NSAAC advises the Secretary of Agriculture on ways to better coordinate USDA's efforts to make agriculture more sustainable. NSAAC is mandated in the 1990 Farm Bill. It has 28 members. Fourteen are from the private sector, and 14 have been appointed to represent federal and state agencies or academic institutions.

***What is Agriculture in Concert with the Environment?*** ACE was started in 1991, when the U.S. Department of Agriculture and the U.S. Environmental Protection Agency (EPA) joined to establish a new grants program patterned after SARE.

This program is administered through the regional administrative councils, along with the SARE program. Its emphasis is on pollution prevention. EPA contributed \$2.9 million to the ACE program between 1991 and 1993. SARE funds have matched the EPA contributions, for a three-year program total of \$5.8 million.

### ***What is the goal of SARE and ACE?***

These programs help to develop a research and an education base for the future economic viability, ecological soundness, and social acceptance of U.S. agriculture. The Farm Bill definition of sustainable agriculture states that farming practices must "enhance environmental quality and the natural resource base upon which the agriculture economy depends" and "make

the most efficient use of non-renewable resources and integrate, where appropriate, natural biological cycles and controls." SARE and ACE complement other USDA programs, such as integrated pest management (IPM) and water quality.

The SARE program places special emphasis on whole-farm systems research, including the profitability of more sustainable methods. Additional projects are funded in the areas of experimental component research, exploratory research, demonstrations, and educational projects.

SARE also addresses the human and social goal of sustainable agriculture to improve the quality of life for farmers and ranchers, members of rural communities, and society as a whole. A central goal is to better understand how the means of production and resulting structure of agriculture will affect quality of life. A national task force has helped the regions develop a framework for integrating social science studies on quality of life into SARE/ACE projects, and for training the regional administrative councils and technical review committees on quality of life issues as related to SARE and ACE projects. The training program was offered for the first time in 1993, and all four regions will have received this training by the end of 1994.

The ACE program is designed to help prevent agricultural pollution. These efforts concentrate on

- promoting adoption of nutrient management planning and reduced-risk pesticides and/or biological controls; and
- protecting ecologically sensitive areas.

These interests are compatible with USDA goals, including those of the SARE program, the Soil Conservation Service, Extension Service and others.

*What new developments will be added in 1994?* A new sustainable agriculture training program will be established under Chapter 3 of the sustainable agriculture legislation. Administered through the federal Extension Service, this new program will provide sustainable agricultural education and training for Extension educators and other interested people. It will operate as a partnership among the State Cooperative Extension Services, CSRS, Soil Conservation Service, farmers and other public and private organizations.

- reducing the use of agricultural chemicals including pesticides and fertilizers;

## Research and Education Project Highlights

Following are the 1993 highlights of SARE and ACE projects in the Western Region.

For more information about projects, note project identification numbers and refer to Table 3 where project titles and coordinators are listed. Expanded progress reports, educational materials and additional background on all funded projects are available through the Western Region's administrative and public information offices (see the "For More Information" section of this report).

### Farmers and Scientists Partner on Long-term Research

Farmers, in partnership with a broad-based team of scientists, are taking the lead in educational programs and the day-to-day management of a twelve-year study in California. The project, which has completed its fifth year, is comparing the effects of conventional, low-input (minimal use of synthetic "inputs") and organic farming methods on a variety of anchor California crops.

University of California researchers report that crop yields of processing tomatoes, safflower, beans and small grains were essentially the same in 1993 across all methods. Low-input corn and tomatoes -- which receive a mixture of organic and inorganic fertilizers -- performed better or equal to crops raised conventionally (with a high reliance on pesticides and other farm chemicals).

Soil fertility and weeds were the biggest constraints to profitability in the organic system, according to scientists. To boost tomato yields, the primary cash crop in the

rotation, tomatoes were grown in the field from transplants instead of seed, which increased yields in both low-input and organic systems.

Researchers say their results show that equal yields are attainable in all types of production methods but costs in the low-input and organic systems remain high. For farm economic health, profitability of the tomato crop must be maximized -- and using tomato transplants is a promising way to increase yields. (Project Number: LW89-18)

"After hearing and reading all the superlatives about how 'healthy' organically farmed soils are, this is the first scientific data I have seen that begins to quantify the different soil parameters involved and how and why they change in transition to organic farming."

Bruce Rominger, grower

### Multiple Water Uses Expanding Farm Diversity

Finding new uses for irrigated water and diversifying on-farm products are key elements of a study based at the University of Arizona. Integrating plant and fish production in the arid Southwest could benefit both the environment and pocketbooks of regional farmers.

Project researchers are investigating the benefits and costs of multiple uses of water

-- mostly irrigation water --by integrating fish farming with crop production.

One of the most promising areas for such systems is the ornamental/landscaping industry. In greenhouse studies, turf grass grown with fish discharge water grew better than turf irrigated with well water. The best grass growth occurred with combined applications of fish discharge water and fertilizer -- better growth than when fertilizer was used alone. In 1993 field studies, growth rates of mesquite trees significantly increased when irrigated with water first used for tilapia fish production. Tilapia fish had an 88.5 percent survival rate when grown in conveyance ditches, showing that actual field irrigation ditches can be used as culture ponds.

When water was shared by a fish farmer and a cotton farmer at one site, the cotton grower saved about \$50 per acre in irrigation costs. In the same study of cotton grown with discharge water, the need for added fertilizers dropped from 180 lbs. per acre to between 40 and 80 lbs. per acre -- a substantial financial savings and significantly less use of synthetic chemicals. (Project Number: AW91-2)

#### Sustainable Potato Production: Costs are Comparable; Benefits are High

Scientists at the University of Idaho are testing rotation crops, biological control and other non-chemical methods to suppress crop pests and disease, improve soil fertility and reduce erosion. Rapeseed green manure cover crops have provided up to 80 percent control of the plant parasite root-knot nematode, as well as accomplished weed control without herbicides. When tracked on eight farmer-owned sites, this method resulted in

potato yield increases from 10 to 50 percent.

Following another rotation with sudangrass green manures, certain potato diseases were reduced as much as 29 percent and yields increased up to 135 percent.

In addition, growing soil-enhancing cover crops of nitro alfalfa or Austria peas prior to potatoes -- whether they were harvested or mixed back into the soil -- provided from 50 to 100 percent of the crops' nutritional needs without synthetic fertilizers.

Results from a recent survey of Pacific Northwest potato growers shows that even though a majority of farmers currently rely heavily on chemical fertilizers and pesticides, potato farmers are very interested in alternatives. A detailed comparison of production budgets from conventional and organic farms revealed that pre-harvest production costs for organic systems were lower on average than conventional farms. Average potato yields were virtually the same. (Project Number: LW91-29)

#### "Trap Crops" Battle Pests and Bolster Yields

Using natural enemies to battle pests is being studied by University of Wyoming scientists who hope to control the cyst nematode, a major blight to the state's most profitable crop, the sugarbeet. By integrating "trap crops" into sugarbeet cropping rotations, researchers have seen up to 69 percent control of the pest and increased crop yields of more than five tons per acre -- a 30 percent yield increase compared with aldicarb-treated plots. Aldicarb is the prevalent chemical treatment for mitigating nematodes.

The trap crop method under study integrates nematode-resistant radishes into crop rotations following malt barley. The radishes allow themselves to become hosts to the parasite and then trap or stunt the pest's ability to flourish in subsequent crops of sugarbeets.

The estimated cost of growing trap crops was about \$90 per acre, which was more than offset by major increases in sugarbeet yields. A companion study of grazing lambs on trap crops suggests that the cost of growing radishes, or another trap crop of mustard, could also be offset by livestock enterprise profits.

In addition to boosting profits through higher yields, this cover crop method can mitigate soil erosion in a severely windy area; help diversify farm enterprises; enrich soils that have been farmed intensively for as long as fifty years; and reduce the use of synthetic chemicals --protecting ground water and farm worker health.

(Project Number: LW91-22)

#### Cover Crops are Replacing Chemicals in California's Near Two Billion Dollar Grape Industry

With a total value of more than \$1.7 billion annually, California grapes are the leading crop grown in the state. Most growers incur direct production costs by applying synthetic pesticides, herbicides and fertilizers. This on-farm research project, led by University of California scientist Frank Zalom, seeks to develop cost effective non-chemical alternatives to manage vineyard pests, weeds and vine nutrition. Use of a self-seeding legume-grass cover crop is proving to be effective at naturally controlling damaging insects and mites, and, when cut and blown into vine rows, is also suppressing weeds.

Findings to date show that cool season legume-grass cover crops can control such crop pests as leafhoppers and spider mites. The presence of the cover crops seems to increase early season activity of predatory mites, resulting in reduced spider mite numbers. Likewise, in vineyards that had suffered from pest problems, cover crops were shown to reduce leafhopper infestations as well. The leafhopper reductions were due to enhanced activity of leafhopper-egg parasites and some spiders -- natural enemies of the vineyard pest. On-farm studies are also showing that yearly accumulation of biomass in vine rows from cover crops can provide adequate weed control so that herbicides can be minimized.

A comprehensive cost/benefit analysis for the cover crop system will be developed in the third year of the study.

Testimonials by participating grape growers show that the use of cover crops has led to reduced reliance on pesticides.

(Project Number: 91-26)



Caption: Managing ground cover between rows of a vineyard. Photo courtesy of Western SARE project LW91-26, led by Frank G. Zalom of the University of California, Davis.

"I have been encouraged by the information that you are generating. Our vineyard has certainly been a testing ground for biocontrol under some extreme insect pressures."

Max Jehle, grower

"I've been very impressed with the project and have adopted the practice in all my vineyards. My neighbors are beginning to use the practice also. It has cut my dependence on chemicals down considerably."

Gerald E. Nelson, grower

"I believe this work has been productive in creating a build-up of soil, vine vigor and a reduction in my use of pesticides."

Jon Marthedal, grower

## Practical Help for Farmers

The *Sustainable Farming Quarterly* -- a newsletter published by the Alternative Energy Resources Organization (AERO) and funded by SARE -- continues to provide timely information, research findings and farmers' perspectives on sustainable agriculture to over 1900 farmers, ranchers, universities, news editors and the expanded agricultural community in Montana and the surrounding region. In a recent reader survey, 81 percent of respondents said that the publication is useful or very useful. Many said they refer to the quarterly often and share it with colleagues, friends and students.

(Project Number: LWD92-4)

## Farmer-to-Farmer, Networking that Works

The Alternative Energy Resources Organization (AERO), with support from SARE, spearheads a program designed to help producers in Montana learn how to farm more sustainably. Farm improvement clubs funded at about \$800 each draw together groups of farmers to share information, problem-solve on-farm issues related to sustainable agriculture, and build a sense of community in rural areas. There are now 22 clubs in the state with about 170 farm and ranch families involved. Key results of AERO's annual survey of farm club members include: 69 percent of club respondents say their involvement in the program has benefited them economically, up from 30 percent in 1992; club issues have broadened to include marketing and enterprise development; and, local technical assistance agencies -- such as the Soil Conservation Service and the state Department of Natural Resources -- are now actively supporting the farm club model and the acceptance and adoption of sustainable agriculture practices among the broader agricultural community.

(Project Number: LW91-23)

"This whole concept of farm clubs is what really in the '30s and '40s in this country revolutionized a lot of agricultural production...And now I see this idea of the clubs resurging...It is a lot easier to do things...if you've got two or three people to support you."

Clint Peck, editor, *Western Beef Producer*

"We'd have never started our group if it wasn't for AERO and...we've acquired some fairly useful data...We have direct hands-on experience with the data so we have more confidence in it."

Bud Barta, farmer

### Ranching in Concert With the Environment

In Montana, scientists and ranchers are working cooperatively to study the sustainability of livestock production and ranching impacts on environmentally-sensitive areas. Twenty-two ranches located on great plains and foothill-mountain range areas are participating in the project; inventories completed on nearly one-half of the ranches show that 80 percent of the land is in good to excellent condition.

Riparian vegetation plays a key role in maintaining fish populations in Rocky Mountain streams bordering rangelands. In evaluating how riparian and stream habitats respond to livestock grazing, scientists confirm that sections excluded from grazing have more stable banks and complex debris within the stream. Fenced sections show greater density, cover and

diversity of woody riparian species than grazed pastures. (Project Number: LW91-24)

### Sustainable "Tools" Compare or Beat Toxic Chemical Inputs in Peach Orchards

Through on-farm trials, University of California scientists and cooperating peach growers in the Central Valley of California are comparing differences between conventional and more environmentally sound, sustainable farm practices. Results from 1993 show that insect pest control in all four sustainable orchard plots was as good or better than conventionally-managed plots, which were treated with broad spectrum (and generally more toxic) pesticides.

Insect control in the sustainable orchards was managed with more specific, lower amounts of pesticides or non-toxic treatments -- thus protecting the ecosystem and lowering worker exposure to synthetic chemicals. As many as three sprayings of a total of 6 lbs. per acre of organo-phosphate insecticides were eliminated in test plots.

Non-toxic treatments for insects include slowly bringing down the nitrogen levels in trees and using composts, manures or cover crops to supply nitrogen, as a mineral source, where feasible.

Also, progress was made toward controlling brown rot (the major fruit disease of peaches) without chemical intervention by maintaining moderately low nitrogen levels in trees, adding organic composts to soil, and cleaning up diseased fruits in trees. Applying compost to the soil was also linked to better fruit quality and less fruit damage from insects.

(Project Number: LW91-28)

## Pacific Northwest Partnerships Foster Cooperative Learning and Research

A Pacific Northwest project -- involving both **Oregon** State University and **Washington** State University -- is experimenting with new ways to set research priorities: by partnering scientists with farmers to conduct and evaluate on-farm research. Several on-farm and research station experiments are underway that examine cover cropping systems in **vegetable** production to enhance soil health. Study hypotheses and approaches were formed jointly by area growers and university-based scientists.

Cover crop trials in Western Oregon are showing that early fall growth of cover crops is essential to capture residual fertilizer leftover from summer crops. One three-year-long study shows that spring cereals planted in the fall can use up to 90 percent of the total soil nitrogen by early January, versus a traditional winter cover crop of cereal rye that takes up only 25 percent. For growers wanting to use legumes as a source of nitrogen, research has shown that vetches and crimson clover have the greatest potential, ranging from 100 lbs. to 150 lbs. of nitrogen per acre per year.

In Washington's Skagit County, county extension personnel have used focus group and facilitation methods developed by this project to organize a diverse public and private sector work group to carry-out local on-farm experiments aimed at reducing groundwater contamination.

(Project Number: LW88-1)

## Cropping Rotations Directly Linked to Barley Yields

**Montana** State University researchers are studying different cropping rotations to enhance soil fertility and watching the effects of planting brassicas -- including spring peas and other herbs -- on subsequent barley crops. Based on site-specific trials, scientists say they are gaining the first evidence that brassica crops can be managed to increase soil nutrients for following **cereal** crops. Cereal yields have been directly related to the amount of nitrogen and phosphorus nutrients cycled through the previous year's brassica crop residues or green manures. It is rare in rotational or green manuring studies to find such strong relationships between the amounts of cycled nutrients and subsequent yields. (Project Number: AW91-3)

## Demonstrating Environmentally Sound Alternatives

A demonstration project spearheaded by the University of **Hawaii** is illustrating how pig farming can be integrated with orchard and garden production to be environmentally sound. This project borrows from methods used in urban areas, the Netherlands and Japan to utilize animal waste products in on-farm crop production and prevent water and air pollution related to pig-rearing. The approach, termed the "deep liter" system, has been adapted for this tropical area and is being taught to farmers through field demonstrations, video education and television documentary coverage. Animal waste is combined with shredded green waste from orchards, gardens and landscapes to produce compost fertilizer. Human labor is minimized by

having the pigs naturally work manure into the green litter. (Project Number: LWE92-2)

### **Biological Warfare on a Major Weed Pest**

The destructive weed, jointed goatgrass, is fast becoming a threat to fall-planted small grains. It now infests an estimated five million acres nationally and is reducing growers' income by \$145 million annually. Scientists at Washington State University are pioneering a promising approach to biological control of this weed by isolating and using soil bacteria to inhibit its growth. This approach could significantly reduce production costs, the need for chemical herbicides and tillage that promotes soil erosion. In greenhouse studies, four isolated bacteria reduced grass growth from 30 to 70 percent. In 1992-93 field tests, two of the four tested bacteria effectively reduced goatgrass. Measurements in August, 1993, showed that above ground weed growth was suppressed by 20 to 30 percent. Bacteria was found to be more effective when used with non-toxic doses of a synthetic herbicide. This biological control approach could reduce farm costs, minimize dependence on pesticides and increase the use of environmentally sound practices to prevent agricultural-related pollution. (Project Number: AW91-5)

### **Water Conservation and Minimal Pesticides for Cash Crops**

Tomato and pepper crops are major food crops in the U.S. and the world. In a three-year study, researchers in California and Arizona aimed to reduce reliance on pesticides and conserve water by managing the micro-environment of plants by strictly regulating soil moisture and applying

plastic mulches. This is especially significant in California and other areas where water use is and will be even more greatly restricted to preserve wildlife, rivers and bays. Project results on low-use watering systems and plastic mulches are already being used and have been adapted to cantaloupe production as well.

Two very serious root diseases of tomatoes -- corky root and *Pythium* root rot -- were reduced by the use of plastic mulches, comparable in effect to fumigation with metham-sodium.

Plastic mulches, especially black colors, significantly increased tomato and pepper yields. The plastic mulches moderated soil temperatures and maintained more even soil moisture, both deterring the spread of diseases. The mulches controlled soil temperatures in different climates, allowing for earlier crop plantings in some geographical areas. Water conservation was achieved by lowering the need for moisture.

Researchers also found that some diseases were greatly reduced by using the bacterial control agent *Pseudomonas* cepacia. The treatment was better for treating *Pythium* root rot than standard synthetic chemicals.

Another bacteria, *Steptomyces*, boosted tomato yields. This bacterial strain seems to induce resistance to some soil diseases as well as some leaf diseases.

It was also found that plant root health prevented insect attack on tomato plant foliage. (Project Number: LW89-13)

### **Protecting Groundwater and High Vegetable Yields**

In study plots in the Salinas Valley of California -- one of the most agriculture-intensive areas in the country --

new cover crop and reduced tillage techniques are being tested on semi-permanent beds to minimize nitrate leaching and potential groundwater contamination. Researchers are experimenting with winter cover crops to retain nitrogen within the agroecosystem and reduce excess mineral drainage into groundwater. To make cover cropping practical and not detract from vegetable "cash crop" profits, winter covers are being grown on raised, semi-permanent beds, and are disked under without reforming beds for succeeding **lettuce** and **broccoli** production. Results from this year show that cover crops can be grown without disrupting vegetable cropping schedules or harming cash crop yields. Cover crops also retrieve up to 100 kilograms of potentially leachable nitrate per hectare over winter. Incorporation of cover crop plant residues into soil contributed to lower synthetic fertilizer needs in lettuce and broccoli crops as well. (Project Number: AW92-6)

### **Site Specific Research Growing From Local Roots**

Using specialized "farmer-scientist focus sessions" (a partnership approach to problem-solving that is also called co-learning), scientists, growers and the local agribusiness community worked together to design and conduct on-farm research for sustainable vegetable production in the Willamette Valley of Western Oregon. The co-learning approach was developed by Oregon State University researchers and county extension personnel, and was supported by SARE. The resulting twelve on-farm trials evaluated the viability of different cover crops and measured their effects in

site-specific areas. Generally, cover crops planted after irrigated vegetables emerged more quickly and had more total growth than cover crops after wheat. Cereal grain cover crops grew more quickly in the fall than legumes; most legume growth was in the spring. Some cover crops produced more than five tons of dry matter. Soil nitrate levels were dramatically reduced under both barley and cereal rye cover crops, signaling better nutrient cycling in the soil and less potential for nitrate pollution. Legume cover crops produced from 28 to 186 lbs. of nitrate per acre, lessening the need for added synthetic fertilizers for vegetable production. (Project Number: LWE92-1)

### **Organic Apple Production Works and Makes a Profit**

Certified organic apple production has expanded to roughly 2,000 acres in California. If this trend continues, organic apple production could soon represent ten percent of total state apple acreage. University of California scientists, extension educators and commercial apple growers are collaborating to compare certified organic apple production with conventional methods in terms of yield, pest control and profitability. The end goal is to publish research-based results intended as guidelines for organic apple production in California. Early results show that organic production is commercially profitable but more costly in the coastal regions and the Northern Central Valley. Profitability depends upon microclimate, varieties of apples grown, pest and disease issues and market prices. Early-maturing apples, Granny Smith and some newer apple varieties have been successfully converted to organic

production. These apple production systems are profitable if the crop is sold at a premium in the fresh market. The North Coast production area has more problems with fungus in the spring of high-rainfall years. However, key pest control has been successful with certified organic methods in all production regions alone or in combination with biological control agents, or supplemental chemical control in the Central Valley.

(Project Number: AW92-9)

### Exploring the Mysteries of Soil Microbiology

Organic and low chemical input farming rely on organic residues as a source of plant nutrients. These farming systems depend on the timely delivery of nitrogen and other nutrients to plants as decomposition of organic matter takes place. Soil microorganisms are significant reservoirs of plant nutrients and carbon, as well as the agents responsible for decomposition and mineralization of residues. Certain plant parasites, nematodes, are important predators of microorganisms and enhance the rate of this nutrient cycling in soil.

As an adjunct to a long-term study comparing alternative farming systems (see LW89-18), University of California scientists are studying the generally unexplored microbiology of soil. Researchers are comparing how microorganisms in soil differ in type and action within conventional versus lower-input farm plots. At a very early stage of the study, research is beginning to identify measurements of microorganisms that are most useful in assessing availability of nutrients to crops. How microbial communities contribute to the

success or failure of a fertility management system in different farming approaches is also becoming clear, which will help identify ways to enhance fertility. The role of bacterial-feeding nematodes in nutrient cycling is being assessed and the most important species are being identified.

(Project Number: AW92-7)



Caption: Deputy Secretary Rominger visits a project site near Davis, California. Photo by Jack Clark, courtesy of Western Region SARE/ACE.

## Western Regional Program Activities

This section of the report outlines the structure of the SARE/ACE program in the Western Region, describes major activities in 1993 and profiles the breadth and depth of research and education efforts in the Region.

### Regional Structure and Leadership

The *Administrative Council* is the official decision-making body for the regional program. The Council sets strategic direction and oversees all research and education activities. The make-up of the Council includes public and private representatives of the broad agricultural community, including farmers, as well as environmental and natural resource specialists. Administrative Council members are listed on the opening page of the report.

The *Western Region Coordinating Committee* (WRCC-67) is an established regional committee of scientists who provide strategic recommendations to the Administrative Council. It acts as the *Scientific Advisory Committee* to the Regional Administrative Council. The Scientific Advisory Committee will take on new responsibilities in the project review process in 1994, asking selected principal investigators of SARE and ACE funded projects to make presentations at annual Committee meetings. The Committee will dedicate one day at each meeting to listen to project coordinators and evaluate the progress of research or educational efforts. In addition, project sites will be visited as opportunities arise or in cases where questions have been raised about the performance of a particular project.

Several site visits were conducted this year and a variety of project presentations were made to both the WRCC and Administrative Council.

### Profile of the Program as a Whole

There are currently 42 active SARE and ACE projects in the Western Region. Project profiles were submitted by coordinators of 32 projects. The profile data reveal some interesting trends.

*Organizational Involvement:* Farms and ranches are directly involved in 27 of these 32 projects, 84 percent of total. Involvement of each kind of organization is shown below:

Organizations	Percent of Projects
Farms and ranches	84
Other for-profit firms	25
Land grant universities	91
Other universities	13
Private non-profit	41
Cooperative Extension	91
Soil Conservation Service	41

*Producer Participation:* Farmers and ranchers contribute to all aspects of the SARE and ACE research and education projects — from identifying sustainable farming issues to designing, conducting and evaluating project results. According to profile data, 499 producers played major roles; 421 of these producers generated ideas for their SARE and ACE projects, as

shown below. These data may significantly understate reality, because only 76 percent of the active projects submitted profiles.

Producer activities	Number of producers
Play major role	499
Generated ideas	421
Helped design	258
Help manage	230
Workshop presentation	135
Land for experiments	113
Demonstrations	123

*Multiple Typology of Projects:* Projects often include several emphases and components. In the Western Region 84 percent of the projects submitting profile data include experimental components, while 63 percent include whole-farm approaches. The table below indicates the percent of projects including the following components:

Multiple types of projects	Percent of projects including this type:
Experimental components	84
Education, training, Information transfer	78
Whole farm systems	63
Economic impact assessment	41
Environmental impact assessment	41
Quality of life impact assessment	16

Recognizing that SARE and ACE projects typically involve two or more subject areas, the projects were categorized as follows:

Subject	Percent of projects including this subject:
Animal agriculture	32
Field crops	42
Specialty crops/forestry	23
Weed control	19
Plant and animal protection	23
Cover crops & habitat	32
Soil, water, nutrient, waste	29
Communication, education, marketing	65
Quality of life	13

## The Grant Process

The 1993 Call for Proposals drew 35 submissions from land grant universities and organizations in the Western U.S. The Call for Proposals again emphasized whole farm systems for the SARE program, and reducing environmental stress from agricultural practices for ACE.

A specialized *Technical Review Panel* met in January to review and rank the proposals. The 1993 review panel included farmers and representatives from the Agricultural Experiment Stations, Cooperative Extension, Agricultural Research Service, Soil Conservation Service, and the Environmental Protection Agency.

Technical Review Panels are specially selected each year by the Program Manager and Program Coordinator. The goal is to assemble a panel that is geographically representative of the West and can provide expertise in the range of subjects included in submitted proposals. In 1993, reviewers represented such disciplines as: agronomy, pest management, soil science, economics, social science, information systems, animal science, range, etc. Farmer members included a cattle rancher, cotton farmer, and vegetable farmer. Individuals were selected from a data base developed over several years; about one-third had previously served on a review panel. Proposal rankings made by the Technical Review Panel were forwarded to the Administrative Council for final funding consideration.

### **Types and Subjects of Projects Funded in 1993**

Twenty-three SARE and ACE projects were newly funded or renewed for funding in 1993. The projects have been categorized by "best type," or the type that best characterizes the effort. The Regional program's funding history according to types of projects funded since 1988 is summarized in Table 1.

In terms of subject matter, the 23 projects funded in 1993 were profiled to show the areas of sustainable agriculture being explored, demonstrated or taught (see Table 2). Projects often deal with more than one of these subject areas; therefore the subject categories are non-exclusive. If, for example, a research project encompasses cover crops as well as quality of life issues, it was listed in both subject categories. Subject areas most

widely addressed in the 1993 funded projects include specialty crops or forestry; cover crops and habitat; or management of soil, water, nutrients or waste. Next, animal agriculture and field crops were the most frequent subjects of projects, followed by (in descending order) weed control; plant and animal protection; communication, education or marketing; and quality of life. The major differences in funding history are (1) the ACE program portfolio contains a higher proportion of projects on management of soil, water, and nutrient wastes, and on animal agriculture; and (2) the SARE portfolio emphasizes more communications and education projects.

Western SARE and ACE research and education projects approved for funding in 1993 are listed in Table 3. The allocation of SARE and ACE funds among the 12 Western States and Protectorates is shown in Tables 4 and 5, respectively.

**Table 1. Number of Grants and Percentage Allocation of SARE and ACE Funds to Various Types of Projects in 1993 and Previous Years, Western Region.**

Project Type Best Describing the Project	Number of Grants in Fiscal Year:		Percent of Total Funds Awarded	
	1993	1988-92	1993	1988-92
Whole Farm Systems	5	18	40	36
Natural Systems	3	0	5	0
Experimental Component	5	17	13	23
Exploratory Component	0	2	0	2
Economic Impact Assessment	0	3	0	5
Environmental Impact Assessment	0	1	0	2
Whole Farm Demonstration Sites	6	7	32	10
Decision Support Systems and Databases	0	3	0	3
Education, Training, Information Transfer	4	19	11	19
Other	0	2	0	0
Total, All Types	23	72	100	100

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**Table 2. Subjects Included in Western Region SARE and ACE Projects in Fiscal Year 1993 and Previous Years.**

**Note:** Since projects usually deal with more than one subject, column data do not add to a meaningful total.

Projects Emphasizing One or More of the Following Subject Areas:	Number of Grants Awarded			
	SARE		ACE	
	1993	1988-92	1993	1988-92
Animal - includes dairy, beef, poultry, sheep, bees; also grazing and pasture	5	9	5	4
Field Crops - includes corn, soybeans, wheat, cotton, potatoes, alfalfa	7	21	3	7
Speciality Crops and Forestry - includes fruit, vegetables, nuts, ornamentals, windbreaks	6	34	6	8
Weed Control - including reduced rates of herbicide and alternatives to herbicides such as tillage and crop rotation	6	22	2	4
Plant and Animal Protection - includes practices such as use of resistant cultivars, crop rotations, biological control and mating disruption for the control of diseases, arthropods, nematodes, vertebrates and other pests; not including weeds	4	19	2	3
Cover crops and habitat management - includes landscape ecology, biodiversity, wildlife	5	26	7	5
Soil, Water, Nutrient and waste management - includes erosion control, nitrate management, animal and crop residue	5	26	7	9
Communication, education and marketing - includes farmer-to-farmer projects; evaluation of alternative farming practices and systems for output performance, financial returns or environmental impacts; decision support such as expert systems and enterprise budgets	6	44	2	2
Quality of life - includes farming communities, demographic studies, and other aspects of quality of life	3	9	1	1

**Table 3. Summary List of SARE and ACE Projects Funded by Western Region in FY1993.**

Project #	Project Title	Project Coordinators	Organizations	SARE and ACE Funds	Non-Federal Matching Funds	Duration
<i><b>Western Region, New SARE Projects</b></i>						
LWD93-6	Navajo Nation Whole Farm/Ranch Sustainable Systems Demonstration Project	Lyle McNeal	Utah State University	\$ 14,000	\$ 0	1 year
LWD93-7	Development of Sustainable Crop and Livestock Production Systems for Land in the Conservation Reserve Program (CRP)	Rex Kirksey	New Mexico State University	14,000	0	1 year
LW93-33	Development of Sustainable Crop and Livestock Production Systems for Land in the Conservation Reserve Program (CRP)	Rex Kirksey	New Mexico State University	208,000	138,007	2 years
LW93-34	Navajo Nation Whole Farm/Ranch Sustainable Systems Demonstration Project	Lyle McNeal	Utah State University	200,000	176,000	2 years
<i><b>Western Region, Continuing SARE Projects</b></i>						
LW91-22	Brassica Utilization in Sugarbeet Rotations for Biological Control of Cyst Nematode	D.W. Koch	University of Wyoming	51,000	91,528	1 year
LW91-23	Farm Improvement Club Network for Sustainable Agriculture	Nancy Matheson	Alternative Energy Resources Organization	27,500	10,000	1 year
LW91-24	Specifying and Analyzing of Whole-Ranch Systems for Sustainable Range Livestock Production in Environmentally-Sensitive Areas	Jack Riesselman	Montana State University	95,000	108,700	1 year
LW91-26	Cover Crops to Facilitate Low-Input Production of California's Raisin, Table and Wine Grapes	F.G. Zalom	University of California	42,142	54,660	1 year
LW91-27	Development of Winter Wheat Cover Crop Systems for Weed Control in Potatoes	C. Eberlein	University of Idaho	8,971	17,377	1 year
LW91-28	A Multidisciplinary Approach to Evaluate and Aid the Transition from Conventional to Low-Input Pest Management Systems in Stone Fruits	K.Daane R.S. Johnson	University of California, Davis/Berkeley	99,938	68,868	1 year

Project #	Project Title	Project Coordinators	Organizations	SARE and ACF Funds	Non-Federal Matching Funds	Duration
<i><b>Western Region, Continuing SARE Projects</b></i>						
LW91-29	Development of Sustainable Potato Production Systems in the Northwest	J.C. Stark	University of Idaho Washington State University Cooperative Extension Service	\$ 110,000	\$ 270,110	1 year
LW91-30	Assisting Resource Poor, Small Scale Farmers with Adoption of Low-Input Technologies at the Rural Development Center Near Salinas, CA	P.L. Gersper	University of California, Berkeley	59,995	87,306	1 year
LWD92-5	Conference on the Science of Sustainable Agricultural Systems	David Bezdek	Washington State University	15,500	0	1 year
<b>FY1993 SARE Total, Western Region</b>				<b>\$ 946,046</b>	<b>\$1,022,556</b>	
<i><b>Western Region, New ACE Projects</b></i>						
AW93-10	Educational Video on Management of Pinyon-Juniper Ecosystems-A New Approach	Howard Shanks	New Mexico Co. South Central Mountain RCD	20,000	5,000	1 year
AW93-11	Calibration of the Pre-sidedress Soil Nitrate Test to Improve Nitrogen Management on Dairy Farms	Neil Christensen John M. Hart	Oregon State University	24,624	19,345	2 years
AW93-12	Range Monitoring in the Upper Stony Creek Watershed	Sheila Gaertner	University of California	13,600	11,400	3 years
AW93-13	A High-Input Crop Production System in Coastal California as a Model for Developing Indicators of Agroecosystems Sustainability	S. Giessman	University of California	40,000	14,530	1 year
AW93-14	Introduction of Cover Crops into Annual Rotations in Northern California	Mark Van Horn	University of California	21,199	14,000	1 year
AWD93-1	Compatibility of Livestock and Water Birds on Improved Pastures	Hudson A. G limp Lewis W. Oring	University of Nevada-Reno	10,000	0	1 year

Project #	Project Title	Project Coordinators	Organizations	SARE and ACE Funds	Non-Federal Matching Funds	Duration
<i><b>Western Region, Continuing ACE Projects</b></i>						
AW91-2	Integration of Aquaculture into an Irrigated Farm to Improve Efficiency of Water and Nutrient Use	Mary W. Olsen	University of Arizona	\$50,000	\$70,855	1 years
AW91-3	Canola, Rapeseed, and Spring Pea as Enhancers of Soil Nutrient Availability and Crop Productivity in Cereal Rotations	M.P. Wescott N.W. Callan	Montana State University	53,000	53,700	1 year
FY1993 ACE Total, Western Region				\$ 232,423	\$ 188,830	
<b>FY1993 SARE and ACE Totals, Western Region</b>				<b>\$1,178,469</b>	<b>\$1,211,386</b>	

**Table 4. SARE Funds Awarded to Organizations in Western States in 1993 and Total 1988 to 1993**

State	1993 Grants		Total 1988-93	
	SARE	Match	SARE	Match
<b>Alaska</b>				
University of Alaska	—	—	2,750	4,500
<b>Arizona</b>				
University of Arizona	35,400	16,500	104,768	58,500
<b>California</b>				
Committee for Sus. Agr.	—	—	9,000	41,000
University of California	202,075	210,834	2,006,115	1,992,508
Mendocino County	—	—	10,000	3,000
State Total	202,075	210,834	2,025,115	2,036,508
<b>Colorado</b>				
Colorado State University	—	—	17,500	4,500
Telluride	—	—	39,850	19,500
State Total	—	—	57,350	24,000
<b>Hawaii</b>				
University of Hawaii	—	—	75,680	116,800
American Samoa	—	—	266,430	308,300
State Total	—	—	342,110	425,100
<b>Idaho</b>				
University of Idaho	63,971	160,997	248,306	520,223
<b>Montana</b>				
AERO	27,500	10,000	112,074	78,309
Montana State University	95,000	107,700	486,034	493,645
State Total	122,500	118,700	598,108	571,954
<b>New Mexico</b>				
Talavaya	—	—	45,000	43,964
New Mexico State University	222,000	138,007	224,750	142,507
State Total	222,000	138,007	269,750	186,471
<b>Oregon</b>				
Oregon State University	—	—	738,616	850,848
<b>Utah</b>				
Utah State University	214,000	176,000	216,750	180,500
<b>Washington</b>				
Washington State University	70,500	126,490	758,391	671,532
<b>Wyoming</b>				
University of Wyoming	51,000	91,528	162,020	288,884
<b>Total SARE Funds</b>	<b>\$946,046</b>	<b>\$1,022,556</b>	<b>\$5,524,034</b>	<b>\$5,819,020</b>

**Table 5. ACE Funds Awarded to Organizations in Western States in 1993 and Total 1991 to 1993**

State	1993		Total 1991-93	
	ACE	Match	ACE	Match
<b>Alaska</b> University of Alaska	—	—	57,233	74,139
<b>Arizona</b> University of Arizona	50,000	70,855	125,700	94,855
<b>California</b> University of California	74,799	39,930	557,930	628,721
<b>Hawaii</b> University of Hawaii	—	—	120,420	111,900
<b>Montana</b> Montana State University	53,000	53,700	100,000	101,800
<b>Nevada</b> University of Nevada	10,000	—	10,000	—
<b>New Mexico</b> New Mexico State University			10,300	33,991
South Central Mountain RCD	20,000	5,000	20,000	5,000
State Total	20,000	5,000	30,300	38,991
<b>Oregon</b> Oregon State University	24,624	19,345	50,000	39,783
<b>Washington</b> Washington State University	—	—	100,000	52,408
<b>Total ACE Funds</b>	<b>\$232,423</b>	<b>\$188,830</b>	<b>\$1,151,583</b>	<b>\$1,142,597</b>

## **Selection of New Host Institution for Western SARE/ACE**

Among the region's major activities in 1993, a search for a new coordinator and host institution for Western SARE/ACE was a high priority. A request to transfer the program from the University of California's Office of the Vice President was announced in August, as part of a reorganizational effort underway at the ten-campus-wide university system. The regional Administrative Council designed an open selection process in which all interested organizations and educational institutions in the Western U.S. could apply for consideration. After review of applications and interviews with potential program coordinators, the Administrative Council voted to approve V. Philip Rasmussen as the new coordinator, hosted by Utah State University. In addition to his duties as regional SARE/ACE Coordinator, Rasmussen has been appointed assistant director of both the USU Experiment Station and Extension Service. The USDA Cooperative State Research Service has approved the selection.

Administration of the regional program will be relocated to Utah State University (USU) over a year-long period. Grant administration of projects funded through 1993 will continue to be handled by the University of California. USU will

become the primary contact for grants approved in 1994 and thereafter. The public information office will continued to be housed at the University of California, Davis; Kristen Kelleher will continue as the key contact for the public and news media at (916) 752-5987.

The University of California has been host to Western SARE/ACE since its beginnings under the leadership of David E. Schlegel, plant pathologist and UC administrator.

## **Success of Science and Sustainability Conference**

More than 200 scientists, university administrators, extension personnel and non-profit and federal agency representatives from across the nation attended the SARE-sponsored conference on "Science and Sustainability: Reshaping Agricultural Research and Education." The forum, held in October in Bellevue, Washington, examined the state of sustainable agriculture on national research and educational agendas. Keynote speaker USDA Deputy Secretary Richard Rominger shared his support for sustainable farming practices as both an agency representative and owner of a family-operated farm. The conference was co-sponsored by the Center for Sustaining Agriculture and Natural Resources at Washington State University.

## Resources on Sustainable Agriculture

The SARE and ACE programs, nationally and regionally, place high emphasis on getting research results and practical information on sustainable agriculture to farmers and educators in a timely and useful fashion.

As a result, almost all Western region projects include a significant outreach component. Many project teams orchestrate farm demonstrations, field days and conferences as well as create educational materials in the forms of handbooks, fact sheets, newsletters and videos. For information about a particular project, contact the Western SARE office or the project coordinator listed in Table 3 of this report.

Following are resources providing information on sustainable agriculture, which were developed with support from SARE/ACE. In particular, the Sustainable Agriculture Network (SAN), a national initiative of SARE, provides electronic and printed information on sustainable agriculture, as well as an electronic network linking hundreds of national and international experts in the field.

### Newsletters

*Sustainable Farming Quarterly*  
Timely information, research findings and farmers' perspectives on sustainable agriculture. Current readership of more than 1,800 in Montana, Washington, Idaho

and surrounding areas. Published quarterly; FREE to subscribe.

Contact:

Alternative Energy Resources Organization  
25 South Ewing, Suite 214  
Helena, MT 59601  
(406) 443-7272

*Pacific Northwest Sustainable Agriculture, Farming for Profit & Stewardship*  
Quarterly newsletter covering research, issues and resources related to sustainable farming in the Pacific Northwest.

Readership of about 2,200; FREE to subscribe.

Contact:

PNW Sustainable Agriculture  
Dr. Jack Waud  
223 E. 4th  
Port Angeles, WA 98362  
(206) 452-7831

*Sustainable Agriculture*

(a publication of the University of California's Sustainable Agriculture Research and Education Program, UC SAREP)

This FREE quarterly publication provides a wealth of news, practical information, announcements and technical and research summaries. UC SAREP also has five books, videos and a number of special publications available on sustainable agricultural topics and issues.

For a resource list or to subscribe to the newsletter, contact:

UC Sustainable Agriculture Research and Education Program  
University of California  
Davis, CA 95616  
(916) 752-7556

## **General Information Guides and Handbooks**

### *The Sustainable Agriculture Directory of Expertise, 1993*

A listing of over 700 people and organizations willing to share their information and expertise in soil-building, pest management, marketing and many other areas of sustainable agriculture. Funded by SAN and compiled by Appropriate Technology Transfer for Rural Areas (ATTRA).

Price: \$14.95

Also available on Folio "Infobase" diskette. To order, send a check or purchase order to:  
Sustainable Agriculture Publications  
Hills Building  
University of Vermont  
Burlington, VT 05405-0082

### *The Showcase of Sustainable Agriculture*

*Information and Educational Materials*  
A compilation of over 300 publications, videos and other materials. Each entry has a detailed product description and ordering information. An excellent resource book for educators and outreach personnel.

Funded by SAN.

Price: \$4.95

Also available on Folio "Infobase" diskette. To order, send a check or purchase order to:

Sustainable Agriculture Publications  
Hills Building  
University of Vermont  
Burlington, VT 05405-0082

### *Farmer/Scientist Focus Sessions: A How-To Guide*

Authored by Daniel Green-McGrath, Larry S. Lev, Helene Murray and Ray D. William

Order up to six free-of-charge.

Contact:

Publications Orders  
Agricultural Communications  
Oregon State University  
Administrative Services A422  
Corvallis, OR 97331-2119

### *Whole Farm Case Studies: A How-To Guide*

Authored by Helene Murray, Daniel Green-McGrath, Larry S. Lev and Alice Mills Morrow of Oregon State University.

Order up to six free-of-charge.

Contact:

Publications Orders  
Agricultural Communications  
Oregon State University  
Administrative Services A422  
Corvallis, OR 97331-2119

### *A Resource Guide to Sustainable*

### *Agriculture in Washington and Oregon*

A guide of more than 200 pages that tells farmers and those who advise farmers how to access existing sources of information on sustainable farming practices tailored to this region. No charge while supply lasts.

Contact:

Guide # EM8531  
Publications Orders  
Agricultural Communications  
Oregon State University  
Administrative Services A422  
Corvallis, OR 97331-2119

## **Cover Crops -- Handbook and Videos**

### *Managing Cover Crops Profitably*

A 114-page practical handbook for farmers. Funded by SAN and produced and edited by the Rodale Institute.

Price: \$9.95

Also available on Folio "Infobase" diskette. To order send a check or purchase order to:

Sustainable Agriculture Publications  
Hills Building  
University of Vermont  
Burlington, VT 05405-0082

### *Creative Cover Cropping in Perennial Farming Systems*

This 27 minute video teaches growers how to use cover crops in orchards and vineyards to protect and improve soil fertility, enhance pest control and provide other benefits. A wide array of plant materials is presented.

Price: \$20

Contact:

UC SAREP  
University of California  
Davis, CA 95616  
(916) 752-7556

### *Creative Cover Cropping in Annual Farming Systems*

Cover cropping is a key tool in sustainable agriculture but presents special challenges when used in row and field crop systems. This 24 minute video depicts the opportunities and constraints in using cover

crops in combination with numerous plants and management options.

Price: \$20

Contact:

UC SAREP  
University of California  
Davis, CA 95616  
(916) 752-7556

## **Coming Soon**

A handbook, to be published by SAN, addressing tillage tools and techniques is due out in 1994.

To order send for information to:  
Sustainable Agriculture Publications  
Hills Building  
University of Vermont  
Burlington, VT 05405-0082

## **More About SARE and ACE Research and Education**

### *The 1993 National Compendium of Research and Education Projects*

Detailed background and annually-updated progress reports on all funded SARE and ACE projects are available in print, on Folio Infobase diskette or via the Internet system of computer networks. The compendium includes all projects from each USDA SARE region: West, North Central, Northeast and South.  
No charge while supplies last.

Contact the communications office of each regional SARE/ACE program for printed regional versions.

Western Region:

Kristen Kelleher  
USDA Sustainable Agriculture, West  
University of California  
258 Hunt Hall  
Davis, CA 95616

North Central:

Lisa Jasa  
13A Activities Bldg.  
University of Nebraska  
Lincoln, NE 68583-0704

Southern:

Gwen Roland  
c/o SARE/ACE Program  
Georgia Experiment Station  
Griffin, GA 30223-1797

Northeast:

Beth Holtzman  
Plant and Soil Science Dept.  
University of Vermont  
Burlington, VT 05405

For SAN information on "Infobase" diskette, contact Phil Rasmussen (the incoming Western regional coordinator), Ag Systems Technology Dept., Utah State University, UMC-2349, Logan, UT 84322-2349. These Infobases are currently for DOS users only, but Windows and

MacIntosh versions are forthcoming. Each disk includes the Infobase plus the software needed to read it. To receive DOS Infobases, send two blank, formatted, high-density 3 1/2 inch disks for EACH database you want to Rasmussen. Please include a self-addressed return label. The complete text of the 1990 Farm Bill is also available on an Infobase.

**SAN and the Information Super Highway**

SAN, the Sustainable Agriculture Network, also sponsors an electronic mail discussion group for users of the Internet. Participants from around the nation and world (numbering 600 at this writing) post notices, report breaking news, distribute newsletters, and request help for locating information or answering specific questions. A calendar of events is also posted regularly. For help on searching the Internet for SAN databases or to learn more about the mail group, contact: Gabriel Hegyes SAN Coordinator National Agricultural Library (AFSIC) Room 107 10301 Baltimore Blvd Beltsville MD 20705-2351 Telephone: 301-504-6425 FAX: 301-504-6409 (Internet: ghegyes@nalusda.gov)

## For More Information

### **Western Region SARE/ACE Program**

*Regional Coordinator (beginning 1994):*

V. Philip Rasmussen  
Utah State University  
(host institution beginning 1994)  
A.S.T.E. Building  
1500 North 800 East — UMC-2349  
Logan, UT 84322-2349  
Telephone: (801) 797-2230  
FAX: (801) 797-4002  
E-mail: soilcomp@cc.usu.edu

*Regional Training Coordinator:*

Jill Shore Auburn  
c/o SAREP  
University of California  
Davis, CA 95616  
Telephone: (916) 752-7556  
E-mail: jsauburn@ucdavis.edu

*Regional Communications Specialist:*

Kristen Kelleher  
University of California  
USDA Sustainable Agriculture  
c/o SAREP  
Davis, CA 95616  
Telephone: (916) 752-5987  
E-mail: kkelleher@ucdavis.edu

### **National Program Staff:**

*SARE/ACE Director (Interim):*

Jerry DeWitt  
National SARE Office  
CSREES-USDA  
342 Aerospace Bldg.  
901 D St., SW  
Washington, D.C. 20250-2200  
Telephone: (202) 401-4640  
FAX: (202) 401-5179  
E-mail: x1dewitt@exnet.iastate.edu

*Sustainable Agriculture Liaison  
for Chapter 3 Training:*

A. J. Dye  
CSREES-USDA  
Room 3851 South Bldg  
Washington, DC 20250  
Telephone: (202) 720-6283  
FAX: (202) 690-2522  
E-mail: adye@esusda.gov

*EPA Sustainable Agriculture Liaison:*

Harry W. Wells  
Environmental Protection Specialist  
Pollution Prevention Office  
USEPA MC 7409  
401 M. St. SW,  
Washington, D.C. 20460  
Telephone: (202) 260-4472  
FAX: (202) 260-0178



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